

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

April 1, 1938.

(TENTATIVE)
Revision of Instructions for Preparing
Preliminary Examination Reports on Watersheds

TO FIELD FLOOD CONTROL COORDINATING COMMITTEES:
(Through B.A.E., F.S. AND S.C.S.)

Attached is the revised outline for the Preliminary Examination Report on run-off and waterflow retardation and soil erosion prevention for flood control purposes to be made on the watersheds mentioned in the Flood Control Act of June 22, 1936, and as amended. This revised outline replaces the one dated February 25, 1937.

The instructions and statement of principles and objectives accompanying the revised outline are to supersede those of February 23 and 25, 1937.

The revised Preliminary Examination outline is much shorter than the one it replaces. This reflects a desire for corresponding brevity in the reports prepared by its guidance.

The preliminary examination reports already submitted will not be changed unless reviews indicate a need for more specific information and recommendations. Reports in the field are in various stages of completion. Those which are complete or practically so, need not be changed structurally. Where it is desirable to point out flood problems and recommendations to conform more closely with the principles and objectives set forth in this outline a memorandum may be added. Other reports should be prepared in accordance with the revised outline and instructions.

FLOOD CONTROL COORDINATING COMMITTEE

By A. C. Ringland
(Chairman)

Principles and Objectives

The objective of the Flood Control Act of 1936 is to protect existing values from flood damage through the control of destructive floods -- an objective not to be confused with the promotion of agriculture per se. The Secretary of War and Secretary of Agriculture are enjoined in Section 2 of the Act to be guided by the principles set forth in Section 1 in the determination of the Federal interests involved. Moreover, the authority conferred and any funds appropriated are supplemental to but independent of all other authority and appropriations of the Department of Agriculture. The Act is not to be construed to limit or retard any agency of the Department in carrying out similar and related activities -- for example the demonstration work or cooperation with soil conservation districts by the Soil Conservation Service or the administration and protection of the national forests by the Forest Service. Neither is it intended that the related activities of Departmental agencies should be expanded through use of flood control funds except as they are to form an integral part of a specific flood control project.

Some of the land-use and conservation programs of the Department of Agriculture are basically educational and in many instances their application necessitates the assumption of primary responsibility by the farmer or land owner with the encouragement of adequate laws. Flood control, however, is a public enterprise and by its very nature is a continuing public responsibility.

The development of the national flood control program as expressed in the Omnibus Flood Control Act involves the correlation of the flood control activities of the Departments of War and Agriculture, the two agencies charged with the flood control program.

Economically a flood control plan must rest upon the direct benefits which it bestows upon the protected areas. Major engineering flood control structures such as storage or detention reservoirs, debris basins, flood walls, and levees are immediately operative in the protection afforded to lives and property.

The benefits from upstream measures may be direct or indirect. They are direct when specifically designed to reduce flood flows and flood damage. They are indirect when designed to accomplish some other purpose but at the same time provide incidental flood control benefits. Strip-cropping would be an example of the latter, while certain upland storage reservoirs or check dams designed to impound or retard water would be an example of the former.

Upstream flood control measures, however, are to be distinguished from the land-use adjustment programs of the Department although some of the techniques employed may be similar. Upstream flood control measures are directed to the control of flood flows and the stabilization

of soils of headwater areas for the protection of existing values downstream. Land use programs are directed to the better use of farm, range and forest soils for the maintenance of a permanent agriculture. Each class of work creates a distinct kind of Federal and local relationship. Each requires a particular organization, distribution of costs and obligations of maintenance. Each can be integrated in the case of many watersheds to further a common program for the conservation of soil and water resources.

In order to allocate public and private benefits, costs and responsibilities, the preliminary examination reports of the Department of Agriculture should, where possible, be made at the same time or after the preliminary examinations of the War Department. Such procedure will indicate whether the watershed operations of this Department are to be auxiliary to or independent of those of the War Department. Obviously our investigations and conclusions will vary accordingly. These factors are to be considered:

(1) Where the War Department has installed or has been authorized to install flood control works the Federal interests in the seriousness of the flood control problems have been established. In such cases it will be the responsibility of the Department of Agriculture to determine the extent of damages which occur above or on tributary streams below the existing or proposed War Department structures and the benefits that might accrue thereto from a watershed protection program. The Department of Agriculture will have the further responsibility of determining the upstream auxiliary measures necessary to complement the downstream engineering works; to increase in effect the flood storage capacity of the reservoirs by the retardation of run-off, and decrease in rate of siltation; and to reduce the shoaling of river channels protected by levees and revetments. Where downstream structures are involved, the cost of upstream works can be justified to the extent they protect the investment in downstream flood control works, in addition to the other flood control benefits that may accrue.

(2) Where the War Department has a plan or plans which have not been authorized, on a given stream the Department of Agriculture recognizes this fact and should integrate its plans with those of the War Department.

(3) Where the War Department has determined that downstream flood control works are not economically or technically justified, it is the undivided responsibility of the Department of Agriculture to determine the Federal interests and whether measures of run-off and waterflow retardation and prevention of soil wastage can be justified for flood control purposes per se. The relation of costs and benefits will be determined in these cases by the appraisal of the related flood damages throughout the whole watershed or such parts thereof as may be expected to be appreciably influenced by the flood control measures proposed by this Department.

(4) Where no preliminary examination has been made by the War Department, the Field Committee should defer its investigations unless specifically authorized to take action by the Departmental Flood Control Coordinating Committee.

Preliminary Examinations

In light of the foregoing principles and objectives, preliminary examinations will, therefore, be definitely directed toward assembling and interpreting facts and considerations of general measures which have a direct bearing on the control of destructive floods and siltation damage. They will be developed sufficiently to permit the reasonable assumption: (1) that the flood problem per se in respect to run-off and waterflow retardation and soil erosion prevention, appraised independently of agricultural or land-use necessities, is of sufficient seriousness to warrant public assumption of responsibility for its control; (2) that the benefits of this control will exceed the costs (including the costs of War Department flood control works) unless the safety of lives and social security are an issue; (3) that there is prospect of cooperation with responsible local or other agencies as contemplated by Section 4 of the Flood Control Act of August 28, 1937.

Preparation of Reports

The preliminary examination reports are to be prepared cooperatively by the field representatives of the various bureaus designated to participate in their preparation. They will, therefore, be joint reports. A preliminary examination of a watershed is to determine whether a survey to develop a specific flood control program is or is not justified on all or a part of the watershed. If such a program appears technically sound and economically feasible, a survey will be recommended. Where such a survey is made it will, in contrast with the preliminary examination, determine the specific program or form of action to be taken, and the survey report which will then be made will outline the detailed methods to be used and present detailed estimates of the cost of this program.

Field Organization for Reports

Regional field coordinating committees are organized to prepare the "Preliminary Examination Reports." These are composed of representatives of the three Bureaus of the Department having major responsibilities in flood control (Bureau of Agricultural Economics, Forest Service and Soil Conservation Service.) Chairmen of these committees will be members of the two latter agencies in accordance with their assigned responsibilities for individual watersheds. (11 Regional Conservators and 12 Directors of Regional Forest Experiment Stations.) Representatives of other Bureaus will be named as consultants for fields of work in which their Bureaus have responsibilities.

Duties of Field Coordinating Committees

It will be the duty of a Field Coordinating Committee to coordinate the flood control activities of the Department as related to the preliminary examination for its particular group of watersheds. It will be responsible for submitting a joint report for each watershed assigned it for preliminary examination. Its members in conference should agree to the part or parts of sections 1 to 6, inclusive, of the outline for which they will independently assemble data, and otherwise so coordinate their work as to prevent conflicts, overlapping or omissions.

After assembling necessary data for a report each member of the committee, or a designated representative thereof, should meet to integrate the data and jointly prepare the material called for by sections 7 and 8 of the outline.

The report, when completed, should be subscribed to by each member, for in this respect an equal responsibility is shared.

The chairman, or his authorized representative, will represent the Department in relations with other agencies, including the Office of Experiment Stations, Extension Service, and the Corps of Engineers, and act as a liaison officer where activities of other bureaus are involved. He will call meetings of the committee to discuss flood control problems, to plan for hearings and preliminary examinations, and to prepare reports. He is responsible for prompt circulation of instructions, information, and reports among the other members; for proper integration of the data to bring out the best thought of the group; and for prompt completion and submission of reports.

The other members of the committee are responsible for the proper assemblage and interpretation of data assigned to them on the various watersheds and for assisting in integrating this into a suitable report.

The chairman and other committee members may delegate any part of their responsibilities to a competent staff associate with the exception that the responsibility of signing the report can not be delegated. Responsibility should be delegated to but one man to act in charge of flood control preliminary examinations and surveys. This includes attending committee meetings, hearings, field work and preparing reports.

Sources of Information for Reports

Much of the material required for the preliminary report will be available in the various field offices of this Department and of other Federal, State, and local agencies. The Corps of Engineers have in their reports and in their files much pertinent information.

The field committees should use the watershed area in square miles or acres as given in the latest report of the Corps of Engineers.

Where no such report is available, area data sent to the field should be used unless better data are available locally. Where local data are used give reason for your belief in their superiority.

Factual data used by the Department of Agriculture should agree with those in the reports of the Corps of Engineers or the differences should be briefly explained.

Some data may have to be collected through public hearings which should be held jointly with the War Department. Separate hearings should be undertaken only by specific authorization from the Washington Committee.

Confidential Nature of the Report

The preliminary report and the recommendations should be kept confidential, except for the Army Engineers. There is no reason why the recommendations may not be discussed with the local District Engineer before the report is submitted.

The Federal responsibility for making recommendations for flood control measures rests with the Secretary of War and the Secretary of Agriculture. The conclusions of the Field Committees are tentative only and until authority has been given for their release, must be held strictly confidential. Section 8, Recommendations, should not be prepared and inserted in the reports until after obtaining such reviews and comments from interested State and Federal agencies upon the factual parts of the reports as deemed advisable.

Form and Submission of Report

The following procedure will be observed in presenting the material in the report:

Each paragraph beginning with the paragraph concerning authority will be numbered successively through the report, irrespective of the title headings.

The cover page and the syllabus will be lettered (a) (b) respectively and the rest of the report will have the pages numbered consecutively.

The report should be prepared on letter size 100 percent rag manifold paper binding at the left edge in "Accobind Folders," or similar binders.

The original and five copies of the report will be submitted by the Chairman of the Field Committee to the Chief of his Bureau for transmission to the Coordinating Committee. Each copy will have attached the supplement as indicated in the outline.

Use title page as given. Names of bureaus will be stated on cover page with signatures of the approving field flood control coordinating committee members responsible for the report. The report will be dated.

Maps (letter size where possible), charts, photographs, and tabulations should be used where possible in order to present the material in a clear and brief form. The material so presented must be definitely pertinent to the discussion in the report, and each map, chart, photograph, or table must be fully titled and dated so that the reader can completely understand the facts presented without reference to the text.

Under each heading in the preliminary outline the material should be presented in short paragraphs, each dealing with one phase of the subject, and summarized in a carefully worded topic sentence. The suggested topics under each heading of the outline indicate how the material may be subdivided into unified coherent paragraphs.

The preliminary report will omit detailed cost estimates, and details of the proposed program.

Scope and Content of Report

Every effort should be made to make the preliminary examination report as brief as possible. In order to make a definite decision for or against a detailed survey, include only information and data which are definitely and specifically relevant to the discussion of flood problems leading to conclusions concerning feasibility of a watershed flood control program. Sections 1 to 6 inclusive of the outline are suggestive of the kinds of material which may prove pertinent, and the field committees are expected to use it only as a guide in tackling the specific problems on each watershed. For each watershed the most significant facts and problems are to be searched out and clearly identified in the course of the examination and then to be logically interpreted and pointedly presented in the report.

The presentation of facts and the discussion of flood problems on the watershed have been separated. The first 6 sections of the report are to be used for the presentation of all factual material and such explanatory statements as are desirable. No data, facts, or information are to be included in these 6 sections that do not definitely assist in the discussion of flood problems and remedial measures in section 7. In the preliminary examination existing information will be used. Only in exceptional cases should first hand field examinations be made, and then only to obtain data vital for an intelligent conclusion. In section 7 an opportunity is given to present a unified and coherent discussion of the various facts of the drainage basin, and in particular areas, which together affect flood problems and remedial measures.

In most drainage basins the various parts of the watershed do not contribute uniformly to flood flows and the resulting damages. Great flood contributing areas discharge large volumes of flood water while other areas do not (See definitions on last page of preliminary examination outline). In making the preliminary examination of the larger watersheds it is the responsibility of the field committees to determine the tributaries where control measures are needed most urgently because of the excessive contribution to flood flows.

Where significant areal variations occur, the great flood contributing areas should be subdivided for purposes of clear description and analysis into flood source areas. The method of choosing and identifying these flood source areas is being left to the field. A flood source area may be identified by unique conditions of land-use, erosion, topography, etc., any one of which might distinguish it as an important contributor to flood problems. The field committees should be able to present a clear and concise picture of the existing conditions and the possible remedies for each of these flood source areas. (See definitions on last page of preliminary examination outline).

In the presentation and discussion of facts concerning damages, remedial measures, and benefits certain principles and objectives should be continually borne in mind.

The damages should be divided into two important groups, flood damages and erosion damages.

The flood damages should deal entirely with the damages caused by the flood flows themselves. All control measures which are to be chargeable to flood control must be justified on the basis of a reduction in the damages caused by flood water or waterborne sediment. These flood damages are of such a nature that any kind of flood control measure which reduces the flood discharge will reduce the damages. The control measure may be in the form of improved land management, better land use, contour furrows, terraces, small or large reservoirs, diversion channels, etc., to be applied as local conditions dictate their economic and technical feasibility.

Erosion damages should deal with damages to the land on the watershed. This damage should be clearly distinguished from the downstream flood damages. The damages caused by erosion on the land may affect only the value of the eroded land itself. Many of the measures used for the control of floods may have but little effect in reducing the erosion damage; the erosion of the land has no bearing on flood damages unless the water and silt from the watershed accumulate in the downstream area sufficiently to cause damage.

Where flood damage figures have not been compiled it will in nearly all cases serve for the preliminary report if a qualitative estimate of the extent of the damage is used. If an investigation of flood damages in some small local area is necessary a good reference

to use in connection with the compilation of damages is the "Definitions and Classified Lists of Flood Damages" of the National Resources Committee.

The preliminary examination outline provides an opportunity in section 7 to discuss upstream flood control measures applicable to the flood problems of the watershed. These measures should be keyed to the flood source areas, which, in turn, should be treated in order of importance according to the extent to which watershed control measures may be expected to reduce floods. Remedial measures should be based on the most accurate information and reliable experiences available. Primary consideration should be given to the direct remedial measures or those that assist directly in reducing flood and siltation damage. However, no plan would be complete which did not take into consideration the proper correlation of the indirect measures with the direct. Indicate the extent to which the control program may be expected to aid in the reduction of flood losses.

Benefits from an upstream flood control program may be direct, as in case of those measures designed solely to reduce flood flows and siltation damage, or indirect, as in case of proper land use practices, having for their primary objective the conservation of soil and water resources, but which in the end may aid in the solution of the flood and siltation problem. The chief concern in a flood control program should be with those measures aiding directly in reducing the damages caused by floods in the stream channels and in the overflow areas and of the preservation and enhancement in the value of property resulting from the reduction in flood hazards. Of less concern are the benefits from indirect measures such as proper land use practices which should be included only in proportion to the extent they contribute to flood control. Expected benefits may be measured in terms of the reduction in the flood volume, height, and debris deposits; in physical amounts of flood and siltation damages; and in increased length of life of engineering structures. Where sufficient information is available, these benefits may be expressed in monetary values.

Estimates of costs of remedial measures should be presented in the preliminary examination report where available data permit, for comparison with the estimated benefits.

Several factors should be considered in determining the urgency of the survey work in each part of the watershed for which a survey is recommended. The criteria which should be considered in determining whether an early survey should be made on any specific area are: Loss of life or heavy damage or both caused by floods; the extent to which watershed control measures may be expected to reduce floods; and the necessity of correlation with the program of the Corps of Engineers in order to provide an integrated flood control program for the drainage basin.

Negative Reports

Preliminary examination reports which do not recommend surveys for any part of the watershed must be submitted to Congress without further study, consequently they should be prepared with special care and section 7 should show clearly that the expected benefits from a watershed flood control program will not be sufficient to warrant the expenditure of funds for a survey.

The flood warning service of the Weather Bureau, while not a direct flood control measure, is an important protective service and the need for it in a flood control program deserves consideration. In some watersheds where an upstream flood control program may not be feasible, flood warning service may be justified as the only contribution to flood protection the Department can make.

(USE COVER PAGE AS GIVEN BELOW)

PRELIMINARY EXAMINATION REPORT

RUN-OFF AND WATERFLOW RETARDATION AND SOIL EROSION PREVENTION
FOR FLOOD CONTROL PURPOSES

(Name of watershed as given in Act)

In compliance with
Section 6 of the Flood Control Act, June 22, 1936

Public No. 738 -- 74th Congress,

(Also give reference to any other acts
authorizing examinations in the watershed.)

FIELD FLOOD CONTROL COORDINATING COMMITTEE

(Chairman)

(Service)

UNITED STATES DEPARTMENT OF AGRICULTURE

(Date)

SYLLABUS

Give a terse statement of significant facts concerning the flood problems and your conclusions concerning the feasibility of a flood control program on the watershed. (Should not exceed one paragraph and should be on page by itself.)

PRELIMINARY EXAMINATION REPORT

RUN-OFF AND WATERFLOW RETARDATION AND SOIL EROSION PREVENTION FOR FLOOD CONTROL PURPOSES

(NAME OF WATERSHED)

(Authority: Insert here in the report, the following paragraph. This paragraph is to be used as the introduction for each and every report. Insert the name of the watershed as given in the Flood Control Act of 1936, or the amendment of 1937)

Authority: This report of preliminary examinations is made in compliance with the Flood Control Act of June 22, 1936, Public No. 738 -- 74th Congress, as follows:

"Section 6 *** The Secretary of Agriculture is authorized and directed to cause preliminary examinations and surveys for run-off and waterflow retardation and soil erosion prevention on the watersheds of ***

"_____."

(Also give reference to any other acts authorizing examinations in the watershed.)

1. Description:

Describe briefly the outstanding facts concerning the physical characteristics of the watershed as related to floods, including such information as: location and size; map of watershed showing principal tributaries by name with inset showing general geographic location; physiography and geology including characteristics of topography, valleys and streams; major geologic divisions; classification of soils by broad groups as related to infiltration, run-off and erosion.

2. Occupancy and Economy:

Give a brief summary of the chief facts pertaining to the occupancy and economy of the watershed as related to floods, such as: population; land ownership and use; land cover; land economy; land management; water economy; and institutional problems.

3. Hydrology:

State briefly the facts concerning the hydrology of the watershed as related to floods, including such information as: characteristics and frequency of storms of flood producing magnitude; history, characteristics, and source of floods.

Show on a map the major or great flood contributing areas, or, in other words, those parts of the watershed contributing materially to flood flows. Give approximate area of each such flood contributing area.

4. Flood Damage and Erosion Loss:
 - a. Give brief summaries of flood damages including siltation and show the location and extent of the flood damage areas on a map.
 - b. Describe briefly and show on map the degree and extent of erosion loss.
5. Flood Control Projects of other Agencies:

Describe briefly any existing or proposed flood control projects of the Corps of Engineers and of other agencies. Show their probable effect on future floods.
6. Miscellaneous:

Give any significant facts concerning flood problems which were not included in the preceding sections. Give brief summary of hearings to show attitude and desires of local people.
7. Flood Problems and Remedial Measures:
 - a. Discuss and interpret the factual data presented in sections 1 to 6, inclusive, so as to present those features of the flood problems which are common throughout the watershed, such as climate, physiography, geology, soils, storm and flood expectancy, etc.
 - b. Where significant areal variations or special flood control problems occur in large watersheds subdivide the major or great flood contributing areas into minor or small flood source areas, (show on a map) each of which has some degree of homogeneity as to characteristics and conditions affecting flood problems, thus giving greater areal significance to the analysis of flood problems and remedial measures. In order of importance (based on the extent to which watershed control measures may be expected to reduce floods) give area of each, discuss briefly each such designated flood source area, showing in a general way (1) the nature, cause and seriousness of the problems contributing to floods, and (2) the control program which might be adopted, indicating the extent to

which this program may be expected to aid in the solution of the flood problems. Should there be flood source areas where a control program is not feasible state clearly the reasons why.

- c. For that portion of the watershed which is not included in a major or great flood contributing area discuss briefly in general terms the conditions and indicate the reasons why this portion of the watershed is not considered a serious contributor to floods. (See section 3)
 - d. For the watershed as a whole, show the relation between the flood source areas and the watershed with respect to (1) the flood problems, (2) the flood damage areas, (3) existing and proposed flood control programs of the Corps of Engineers and other agencies, (4) remedial measures, and (5) expected benefits.
8. Recommendations:
- State specifically whether you do or do not recommend a survey for all or part of the watershed. If a survey is recommended state specifically what part of the watershed is to be covered. If instead of reporting upon entire watershed as a unit it seems desirable to prepare reports in several portions separately, indicate these portions and the areas to be surveyed. In all cases where a survey is recommended indicate the degree of urgency by stating whether the survey should be undertaken immediately or should be deferred.

APPENDIX

- A. List the most important sources of factual information used in this report.
- B. Include all maps, charts, tables, photographs, and other material relevant to the discussion but difficult to insert in the body of the report without interrupting the orderly presentation.
- C. List the flood control hearings giving location, date, and attendance for each hearing, indicating the various interested groups represented.

SUPPLEMENT

(To be submitted with the preliminary report where a survey is recommended, but not bound with the report.)

Give here rough estimates of the time and money necessary for the recommended survey, of each part recommended as of immediate urgency.

- (a) The estimated cost of the survey recommended, stating important considerations used in arriving at this estimate,
- (b) The estimated length of time which such a survey will require,
- (c) Give your opinion as to the cooperation that might be expected in the execution of a flood control program.

DEFINITIONS OF TERMS

Floods are considered as unusually large flows of water in any reach of the stream in excess of the capacity of the stream channel. They are usually of such a size as to cause measurable damage to property affected. Generally, floods are classified as major and minor for which there is no definite distinction except that major floods severely affect large areas.

Flood loss is any loss - partial or complete - in goods, services, or life, resulting from the action of flood waters.

A great flood contributing area is the watershed of one or more tributaries from which is frequently discharged a material portion of the flood flow injuriously affecting the flood plain below the confluence of the streams involved.

A flood source area is a land-use subdivision of a great flood contributing area relatively homogeneous with respect to those land use and other characteristics which are associated with rapid run-off and erosion, thus causing it to be a significant contributor to floods and siltation damage. It may comprise one or more tributaries, a part of a tributary, a headwater area which may or may not cut across tributary drainage lines, or other such areas.

"Definitions and Classified List of Flood Damages", by the National Resources Committee is a good reference to use in connection with the compilation of damages.

(USE COVER PAGE AS GIVEN BELOW)

UNITED STATES DEPARTMENT OF AGRICULTURE

FLOOD CONTROL COORDINATING COMMITTEE
WASHINGTON

April 15, 1938.

(TENTATIVE)

SURVEY REPORT

RUN-OFF AND WATERFLOW RETARDATION AND SOIL EROSION PREVENTION
FOR FLOOD CONTROL PURPOSES

(Name of watershed as given in Act)

In compliance with

Section 6 of the Flood Control Act, June 22, 1936

Public No. 738 -- 74th Congress,

(Also give reference to any other acts
authorizing examinations in the watershed.)

FIELD FLOOD CONTROL COORDINATING COMMITTEE

(Chairman)

(Service)

UNITED STATES DEPARTMENT OF AGRICULTURE

(Date)

SYLLABUS

(Give a brief terse statement of the significant facts concerning the most serious flood problems and your conclusions concerning the feasibility of a flood control program on the watershed. Should not exceed one page and should be on page by itself.)

_____(b)_____

INDEX

(Place index on separate page immediately preceding the introduction.)

(c)

SURVEY REPORT

RUN-OFF AND WATERFLOW RETARDATION AND SOIL EROSION PREVENTION FOR FLOOD CONTROL PURPOSES

(NAME OF WATERSHED)

(Authority: Insert here in the report, the following paragraph. This paragraph is to be used as the introduction for each and every report. Insert the name of the watershed as given in the Flood Control Act of 1936, or the amendment of 1937.)

Authority: This survey report is made in compliance with the Flood Control Act of June 22, 1936, Public No. 738 -- 74th Congress, as follows:

"Section 6 *** The Secretary of Agriculture is authorized and directed to cause preliminary examinations and surveys for run-off and waterflow retardation and soil erosion prevention on the watersheds of *** " _____ ."
(Also give reference to any other acts authorizing examinations in the watershed.)

I. SUMMARY: (Give a brief summary of the most important material substantiating the recommendations. Emphasize the discussion of flood problems and remedial measures. Should not exceed two pages.)

A. Factual Information Concerning Watershed.

B. Flood Problems of the Watershed and Application of Remedial Measures.

1. Flood problems and remedial measures for the watershed as a whole.

2. Flood problems and remedial measures for specific areas.

C. Plan of Improvement.

II. FACTUAL INFORMATION CONCERNING WATERSHED: (Include in this section only factual data having a bearing on the problems of the watershed as related to flood control. Use tabulations and maps where possible. Narrative enlargement, interpretation and discussion reserved for Section III. Con-

fine all written matter to a brief presentation of facts. This outline is suggestive of information needed for intelligent analysis, discussions, conclusions, and recommendations.)

A. Description: (Include here a brief description of the physical features of the watershed supplemented by maps and tabular information.)

1. Location and size:

Prepare a map showing general geographic location; a map of watershed showing principal tributaries by name; a tabulation giving for each tributary, name, length in miles, and drainage area; also give the total area of watershed.

2. Climate:

Give data concerning factors such as temperature, winds, humidity, sunshine, length of growing season, frozen ground, etc., during flood seasons and as affecting remedial measures. (All information pertaining to precipitation to be included in Hydrology Section.)

3. Physiography:

Give statement describing composite surface features, paying particular attention to any arrangement in the topographic characteristics directly affecting flood problems, such as slope, exposure, elevation (absolute and relative), shape of valleys, gradient of streams, etc., for watershed as a whole and for tributaries.

4. Stream channel characteristics:

Describe gradient of streams; extent of bank erosion; character, location, and movement of streambed deposits; channel obstructions, etc.

5. Geology:

Give brief description of geology of watershed and sketch map showing general location and extent of major geologic divisions where such factors as geologic structure, faults, limestone caverns, glacial deposits, etc., affect infiltration, groundwater and run-off.

6. Soils:

a. Soil characteristics:

Classify by broad groups describing characteristics.

Prepare a tabular description of soil groups including the most important facts such as soil classes, parent material, topography, fertility, profile characteristics, moisture relations, erodibility, etc. Also submit reconnaissance soil conservation survey map. (See instructions for example.)

b. Erosion:

Show in tabular form the degree and extent of various types of erosion including correlation of soil type and erosion, slopes and erosion, land use and erosion. Submit maps. (See instructions for example.)

7. Miscellaneous: (Insert here any facts concerning the physical characteristics of the watershed that do not come under the above subheadings.)

B. Occupancy and Economy: (Where the area included in the report is large and where significant variations in certain areas produce special problems -- flood source areas or flood damage areas -- it is desirable to treat these areas separately rather than to develop meaningless averages for the watershed as a whole.)

1. History of watershed developments:

Describe the original condition of watershed and the subsequent changes in land cover and economic development. (For example, the drainage of swamps, clearing of forests, and plowing of prairies have a direct bearing on run-off. Man's encroachment on the flood plain with highways, railroads, farms, industrial development, cities, levees, dams, etc., has a direct bearing on damage from floods.)

2. Population:

Indicate population density, distribution, and trends. Present significant data graphically. Indicate separately, population directly affected by major and minor floods, either local or general.

3. Land Ownership:

Give area and proportion of land in different classes of ownership such as Federal, State, County, etc.; reservations; and private. Show important types of ownership on map.

4. Present major land uses:

Present in tables and on a map the percentage of land

in farms (census definition) and appropriate breakdown of other land not in farms, such as forests, cities, parks, etc. Show approximate extent and location of submarginal farm land areas.

5. Present land cover:

Show significant types and character of land cover in tabular and map form. Include information concerning such cover types as pastured and non-pastured farm woodlots, commercial forest areas, and cutover areas; burned-over areas; cleared, improved, and unimproved pasture, and permanent grazing areas; and cultivated crops, showing extent to which they protect the soil.

6. Land economy:

a. Economy of land in farms:

Prepare map showing significant types of farming and ranching areas such as general, dairy, livestock, cash grain, cotton, fruit, subsistence, part-time, irrigation, dry farming, etc. For each type of farming area briefly describe typical farm organization. Also for each give data showing size of farm, land values, indebtedness, tenancy, income, tax burden, tax delinquency, trends in land in farms, trends in farm woodland and in crop acreages, etc.

b. Economy of rural land not in farms:

Show on a map the significant types of areas utilized for the production of wood, timber, game, etc., and also show unproductive areas. For each area give data showing land values; tax burden; tax delinquency; productivity; stumpage prices, operating costs, market prices, and marketability of wood and timber products; and other facts bearing on whether the land can be profitably operated by private owners in such a manner as to provide proper watershed protection.

7. Land management:

a. Management of land in farms:

Describe the prevalent land practices such as crop rotations, cropping practices, method of cultivation, use of terraces, etc.

b. Management of rural land not in farms:

Describe the present management of woodland, game land, wasteland, etc.; giving information concerning such factors as fire protection, grazing of woodland, silvicultural practice, logging practice, and balance of game to natural food supply.

8. Water economy:

Describe the industrial, commercial, agricultural and domestic use of water for transportation, power, irrigation, water supply, etc.

9. Institutional problems:

Give statements of existing laws and regulations that may obstruct or facilitate flood control programs. This may include existing regulations of water rights; flood plain and rural zoning; enabling legislation for public land acquisition, soil conservation districts, grazing districts, irrigation districts, tax delinquency reversion laws; etc.

C. Hydrology: (Much of this information can be presented in map, tabular, or diagrammatic form. For most watersheds, information for this section of the report will be available from the Corps of Engineers.)

1. Precipitation:

a. Storms:

Describe the storms of flood producing magnitude including characteristics, intensity duration relations, storm frequency, seasonal and geographic occurrence, isohyetal maps of storms, etc. Also describe storms causing erosion losses, whether of flood producing magnitude or not. Give precipitation data for storms causing floods and erosion.

b. Snow:

Describe the snow cover giving the depth, water content, and extent of the snow cover throughout the winter season. Give table showing average monthly and average annual snowfall for significant stations within and adjoining the watershed indicating for each the period of record on which the averages are based. (Make use of snow survey data where available.)

c. Normal precipitation:

Describe the character, intensity, and seasonal distribution of the normal rainfall. Give table showing average monthly and average annual precipitation for significant stations within and adjoining the watershed indicating for each the period of record on which the averages are based. The distribution of average annual rainfall on the watershed may be illustrated on a map.

2. Streamflow: (The data of the Corps of Engineers may be supplemented for the main stream and for the important tributaries by other information obtained from local sources.)

- a. Floodflows:

Give history of floods including information concerning the causes of floods; flood height and discharge showing the discharge per square mile of drainage basin (including the discharge from high intensity rainfall on small areas); flood frequency and occurrence; condition of channels; the turbidity of flood waters; the movement of bed load; etc. Also give similar information for mud flows. Give characteristics of floods from which local interests want protection as developed at hearing. Show on a map the major or great flood contributing areas, or, in other words, those parts of the watershed contributing materially to flood flows.

- b. Normal flows:

Describe regimen of the stream; maximum channel capacity, average and minimum flow including the discharge per square mile of drainage basin, stream discharge showing mean monthly and annual discharge both total and per square mile, describe special run-off conditions, turbidity or normal and low water flows, etc.

- c. Existing improvements affecting stream flow:
Describe existing improvements affecting both flood and normal flow.

3. Groundwater:

Give information concerning variations in the groundwater level, available storage capacity, replenishment; overdraft for consumptive purposes, flow and discharge, etc.

- D. Flood Damage and Erosion Loss: (Give information and data for separate flood damage areas where necessary. Also point out relation between flood damage areas and flood source areas contributing water and silt.)

1. Flood damage: (Include here only that damage caused by floods in the streams and in the areas subject to overflow. Existing information or data for the main stream and for important tributaries may be supplemented by information obtained from local sources. Explain

any differences between your estimates of monetary damages and those of the Corps of Engineers.)

a. Description of flood damage:

Describe the damage accompanying the different types of floods. State which type of flood causes the most serious damages over a period of years. Indicate to what extent improvements of all kinds encroach on the flood plain. Show on a map the location and extent of the flood damage areas.

b. Direct flood damage:

Show in tabular form the monetary damage from flood and flood borne sediment (including mud flows) separated into damages to municipalities, navigation, reservoirs, irrigation works, highways, railroads, industries, commercial property, private urban property, and private rural property; and into damage to land from scouring or deposition; to crops and livestock; to improvements and structures; to equipment, supplies, and merchandise; etc. (Include only the actual cost of water and debris removal, moving goods, renovation, repairs, etc., and value of destroyed property. These data should be obtained from existing compilations. Explain the methods used in preparing these estimates and compilations sufficiently to indicate how the costs and valuations were determined and their reliability. Also state the frequency of the flood or floods which caused the damages. If data are not available a qualitative statement should be used to cover this part of the report giving your opinion as to whether there are important monetary damages or not.)

c. Indirect flood damage:

Give available estimates or your opinion of the losses indirectly caused by floods including the reduction in property values resulting from a present estimate or discount of future flood damages, estimated loss of business during restoration (excluding that which is merely delayed), loss of markets for produce or merchandise, etc.

d. Intangible flood damage:

Give your opinion concerning the extent to which floods cause loss of morale, sickness, epidemics, damage to fish and game, damage from insects, spreading of noxious weeds, etc.

e. Loss of life:

2. Erosion losses: (Include here all losses to the land itself through sheet erosion or gullying.)

a. Direct erosion losses:

Give monetary value of erosion damage to the land. (Compute by means of the estimated loss in productivity or by means of the reduction in the capital value of the land, and show briefly how the results are obtained.)

b. Indirect erosion losses:

Include here the reduction in taxable wealth (other than the eroded land), decline in business and commerce, etc.

c. Intangible erosion losses:

Give your opinion as to the extent to which erosion causes reduction in standard of living, decline of institutions, and damage to the functioning of social works within the affected areas.

E. Flood Control Projects of Other Agencies:

Describe briefly any existing or proposed flood control projects of other agencies and show their probable effect on future floods.

F. Miscellaneous:

III. FLOOD PROBLEMS OF THE WATERSHED AND APPLICATION OF REMEDIAL

MEASURES: (This section provides for the interpretation and discussion of factual data presented in Section II to give a picture of the flood problems of the watershed, and a discussion of the application of the remedial measures.)

A. Flood Problems and Remedial Measures for the Watershed as a Whole:

1. Flood Problems:

Discussion of those factors which make floods on the watershed a serious problem, including such factors as climate, physiography and geology; the possibilities of recurrent storms of flood producing magnitude, and flood expectancy; the population, industry and commerce affected by floods; the probable future flood damages; etc. Show relation between each problem area and watershed as a whole; Estimate extent to which flood damages reflect deteriorated watershed conditions, and give your opinion as to what extent they are purely a local problem.

2. Remedial Measures:

Discuss coordinated program of remedial measures and expected benefits for the watershed as a whole in relation to existing conditions and problems. (Include here only those aspects of the development program which are generally applicable to large parts of the watershed.)

3. Economic Adjustments:

Discuss the general economic and institutional factors contributing to the flood and erosion problems of the watershed and of the measures necessary to effect beneficial changes.

B. Flood Problems and Remedial Measures for Specific Areas:

(Break down the area into logical subdivisions or flood source areas from the standpoint of the application of remedial measures. This breakdown should be made where it will assist in presenting a picture of what the problems are, how serious they are, and what can be done about them. The discussion should give a general idea of the benefits to be obtained from the control measures.)
(For each flood source area show:)

1. (Insert name of flood source area.)

a. Flood Problems:

Discuss inter-relation of factual data (presented in Section II and show how rainfall, soil character, topography, present land management practices, etc., relate to flood conditions, run-off, and erosion.

b. Remedial measures:

Discuss coordinated program of remedial measures and expected benefits applicable to specific conditions within the area.

(1) Vegetative measures:

Discuss vegetative control measures and show how they may be applied and developed through changes in types of vegetal cover, and through improved land management involving crop rotations, farm practices, forest practices, etc.

(2) Mechanical measures:

Discuss the application of terracing, contour furrowing, basin listing, land drainage, dams, water diversion and spreading, gully control, stream bank protection, stock water development, etc.

- c. Economic and institutional adjustments:
Analyze factors needed to encourage and permit application of remedial measures as change in type of farming and farm size; changes in land use including retirement of submarginal lands to conservation uses for forests and wildlife; cooperation of the AAA program; cooperation in program of county agricultural planning committees; employment of soil conservation and grazing districts; necessary adjustments of water rights and irrigation districts regulations; rural zoning including flood plain zoning; tax adjustments; changes in farm tenancy; population adjustments; etc.

IV. PLAN OF IMPROVEMENT: (Include plan of watershed development on basis of special flood source areas to aid in flood control)

- A. Plan for Immediate Development: (Include in this section a sufficiently detailed plan of improvement to be used as the basis for an immediate operations program, together with detailed cost estimates for each phase of the work) (For each flood source area show:)

- 1. (Insert name of flood source area.)

- a. Measures chargeable exclusively to flood control. (Include only measures serving exclusively for flood control, their adoption and use to be fully justified by resulting flood control benefits in the form of reduction in the flood damages itemized in Section II,d,1. Use subheading for each control measure.)

- (1) (Control measure)

- (a) Detailed plan of improvement:
 - (b) Detailed cost of estimates:
 - (c) Analysis of costs and benefits:
 - (d) Cooperation:
State the extent of cooperation by participating agencies, organizations, and individuals.

- (2) (Control measure)

Etc.

- b. Measures chargeable to flood control and to other Benefits: (Include all measures that serve for

flood control and for other purposes, their adoption and use being justified by the combined benefits of their multiple use.)

(1) (Control measure)

- (a) Detailed plan of improvement:
- (b) Detailed cost estimates:
- (c) Analysis of costs and benefits:
- (d) Cooperation:
State the extent of cooperation by participating agencies, organizations, and individuals.

(2) (Control measure)

Etc.

- c. Measures not chargeable to flood control: (Include under this heading those measures which although having auxiliary flood control effects are completely justified by other economic benefits.)

(1) (Control measure)

- (a) Detailed plan of improvement:
- (b) Detailed cost estimates:
- (c) Analysis of costs and benefits: (For soil conservation projects give estimate as to the economic value of the soil and land lost through sheet and gully erosion, and as to whether the land has sufficient agricultural value for the production of farm or timber products to justify a soil conservation program conducted by the landowners themselves, or if necessary with whatever Governmental assistance may be justified by future values of the land to society.)
- (d) Cooperation:
State the extent of cooperation by participating agencies, organizations, and individuals.

(2) (Control measure)

Etc.

d. **Summary of costs and benefits:**

Give a complete summary of costs of control measures designated for immediate development and of the expected benefits, together with the ratio of costs to benefits and a statement of the justification of the watershed program.

B. **Plan for Deferred Development:** (Include here plans and approximate cost estimate for flood source areas on which operations programs are not to be undertaken immediately.) (For each flood source area show:)

1. (Insert name of flood source area or subdivision.)

a. Measures chargeable exclusively to flood control. (Include only measures serving exclusively for flood control, their adoption and use to be fully justified by resulting flood control benefits in the form of reduction in the flood damages itemized in Section II,d,1. Use subheading for each control measure.)

(1) (Control measure)

- (a) Plan of improvement:
- (b) Approximate cost estimates:
- (c) Analysis of costs and benefits:
- (d) Cooperation:

State the extent of cooperation by participating agencies, organizations, and individuals.

(2) (Control measure)

Etc.

b. Measures chargeable to flood control and to other benefits: (Include all measures that serve for flood control and for other purposes, their adoption and use being justified by the combined benefits of their multiple use.)

(1) (Control measure)

- (a) Plan of improvement:
- (b) Approximate cost estimates:
- (c) Analysis of costs and benefits:
- (d) Cooperation:

State the extent of cooperation by participating agencies, organizations, and individuals.

(2) (Control measure) .

Etc.

- c. Measures not chargeable to flood control: (Include under this heading those measures which although having auxiliary flood control effects are completely justified by other economic benefits.)

(1) (Control measure)

- (a) Plan of improvement:
- (b) Approximate cost estimates:
- (c) Analysis of costs and benefits: (For soil conservation projects give estimate as to the economic value of the soil and land lost through sheet and gully erosion, and as to whether the land has sufficient agricultural value for the production of farm or timber products to justify a soil conservation program conducted by the landowners themselves, or if necessary with whatever Governmental assistance may be justified by future values of the land to society.)
- (d) Cooperation:
State the extent of cooperation by participating agencies, organizations, and individuals.

(2) (Control measure)

Etc.

- d. Summary of costs and benefits:
Give a summary of approximate costs of control measures designated for deferred development and of the expected benefits, together with the ratio of costs to benefits and a statement of the justification of the watershed program.

V. RECOMMENDATION: (State briefly whether the facts developed by this survey show an economic justification for an operations program for all or part of the watershed making reference to plan of improvement and indicating extent of Federal participation.)

VI. APPENDIX:

- A. List of most important sources of factual information which have been used in report.
- B. All maps, charts, tables, photographs, and other material relevant to the report but difficult to include in the body of the report without interrupting the orderly presentation.

14

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

February 8, 1939

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING AND WORKING COMMITTEES:
(Through B.A.E., F.S. and S.C.S.)

Subject: Survey Work Outline

Attention is invited to page two of the Preliminary and Tentative Instructions dated July 15, 1938, in which the functions of the Field Working Committees are outlined. It will be noted that the statement is there made that each Field Working Committee is to be responsible for the development of programs and procedures for preliminary examinations and surveys.

Experience gained from the watershed surveys now under way, shows conclusively that real progress cannot be made unless the working committee, together with the survey leader and the senior representatives of each Bureau on the survey, draws up plans of procedure for the survey work. After the selection of the survey leader and the senior representatives for any watershed, the first task of this group should be to outline a plan of work for the survey. It must be understood that this is a definite responsibility of the working committees in each region, although they should have the assistance of the party leader and senior representatives. On future surveys it will be expected that the preparation of such a plan of survey work will be undertaken, completed and approved by the appropriate field coordinating committee before any significant obligations are incurred relative to personnel, equipment, or other expenditures of time or funds.

The preparation of a plan of survey work will enable each Bureau representative, the party leader, the field working and coordinating committees and others to make better estimates from time to time as to the progress of the work and the integration of each Bureau's phase of the activity and of the survey as a whole. Since it is to be expected that the senior representatives and supervising personnel for each survey have a plan of action for the survey in mind, it is reasonable to assume that these arrangements have been or could be put into written form. Heretofore, such plans of survey work have not, in some cases, been submitted to this Committee. Where these plans have not been submitted to Washington it is suggested that this be done at your earliest convenience. It is expected, too, that this procedure would be a distinct aid to Washington people planning to visit the surveys and would go far toward increasing our appreciation of the field men's problems and point of view.

These plans of work need not be submitted to Washington for formalized approval before work on a watershed can proceed, except where the survey has yet to be approved by the Secretary.

A plan of survey work need not be in great detail, and it need not be considered a final and binding commitment as to the type of work to be accomplished or the method of attack. It should be a simple and clear-cut statement or outline of the objectives of the important phases of the survey work, the priority assigned to those phases, the responsibility for their achievement, the survey methods to be followed, and the integrating relationships of the various parts of the total survey plan of procedure. For most watersheds, a plan of survey work need not comprise more than a few pages. It is to be expected that these plans may be subjected to considerable revision as to details as the survey party grows more familiar with the watershed problems, data available from other agencies, and the details of the watershed itself.

The outline need not be expressed in terms of specific dates or man-days work. It should show the steps which are to be taken to reach the objectives, accomplish the major lines of investigations and evaluation of findings. It should make a clear distinction between the types of survey work which are to be carried on for the entire watershed as compared to those for flood contributing areas or specific sample areas; the work to be done by specific bureaus as compared to the work to be done jointly and in thorough-going cooperation among the Bureau representatives. A plan should show the type of information to be secured in detail as compared with that which will be general, and the data which are to be gathered first-hand and which will be secured from secondary sources.

A well thought out plan, by outlining what needs to be done, when, and how, should form a sound basis for estimating the number and training of the personnel needed to complete the job satisfactorily as to time and adequacy. The desirability of early formulation of personnel requirements at the beginning of a survey is obvious.

It should be re-emphasized that such a plan of survey work needs to be drawn up in cooperation with, and approved by, the field working and coordinating committees; and, most important, that this be done before specialized personnel are employed and before any large amount of work is undertaken on any one phase of the work.

In the preparation of survey plans the District Engineer of the Corps of Engineers should be consulted on certain phases of the survey work of common interest, such as storm phenomena, storm surface run-off, stream discharge, sedimentation of channels and siltation of reservoirs, flood source areas, damaged areas and appraisal of damages.

In order to coordinate the survey work to the greatest extent possible with other activities of our own Department, it has been the practice of this Committee to inform liaison representatives of the various bureaus whenever the Secretary authorizes a survey. Additional information on the form a survey is to take is sometimes desired by these bureaus. It is suggested, therefore, that mimeographed copies of the

survey plans be held available for use by associates in the Department, as well as for the members of the major bureaus of interest. In any case, it is requested that copies of the survey plans be sent to the respective bureau offices in Washington with an extra copy for the Committee's office. This procedure will provide a basis for coordination of the Department of Agriculture's program with that of the Corps of Engineers.

FLOOD CONTROL COORDINATING COMMITTEE.

By *A. C. Ringland*
A. C. Ringland, Chairman.

